Title Liquid Layer Lab

Name, Date, Lab partner

Introduction:

-
-

Sep 13-8:26 AM

Methods and Materials

Materials:

1 x 25mL graduated
4 x 10mL graduated
Substances: Glycerol 5mL
" Corn Oil 5mL

Methods:

1. Measured 5mL of glycerol, corn oil,
2.
3.

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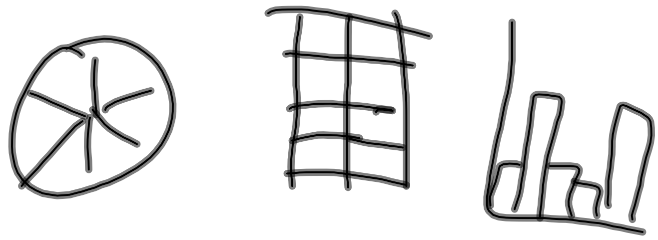
→ **Results:**

Data



→ **Conclusion:**

Write out your final concept of how, why lab results occurred

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Summary:

1-2 sentences summarizing the lab

Sep 13-9:07 AM

2.1 Units + Measurements

Review vocab: mass- the amount of matter and how much space it takes up

Main idea: chemists use internationally recognized systems of units to communicate their findings

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I. Units

A. International System of Units (SI units)

1. System was developed so units of measurement could be communicated on a universal scale

II Base Units and SI prefixes

A. seven base units in SI

B. A Base unit is defined as a unit in a system of measurement that is based on an object or event in the physical world

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Table 1

Quantity	Base Unit
Time	seconds
Length	meter (m)
Mass	kilo (kg)
Temperature	Kelvin (K)
Amount of Substance	mole (mol)
Electrical current	Ampere (A)
luminocity	candela (cd)

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Prefix	Symbol	Numerical Value	10^x
Giga	G	1,000000000	10^9
mega	M	1,000,000	10^6
Kilo	K	1,000	10^3
—	-	1	10^0
deci	d	0.1	10^{-1}
centi	cm	0.01	10^{-2}
Milli	m	0.001	10^{-3}
Micro	μ μ	0.000001	10^{-6}
nano	n	0.000000001	10^{-9}
Pico	P	0.000000000001	10^{-12}

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E. Fahrenheit vs. Celsius

1. $°F = 1.8(°C) + 32$

   a. $35°F \rightarrow °C$

$$\frac{35°F - 32}{1.8} = 1.7°C$$

F. Kelvin to Celsius Conversion

1. $K = °C + 273$

III Derived units

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A. A unit is defined by a combination of base units, this is called a <u>derived unit</u>

1. volume (cm^3) → density (g/cm^3)

B. Volume - the space occupied by an object

1. volume (for a rectangle/cube) is generally length x height x width = $\underline{m^3}$ (m, m, m)

2. Figure 6 in Book

   a. $1 mL = 1 cm^3$

   b. $1 L = 1000 mL$

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C. Density - a physical property of matter and as the amount of mass per unit volume

1. common units of density are grams per cubic centimeter (g/cm^3) for solids and grams per milliliter (g/mL) for liquids + gases
2. The density of a substance cannot be measured directly
   a. Density is calculated using mass + volume measurements

☆ 3. Density equation: $\frac{mass}{volume}$

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a. example: volume = $5.0 cm^3$
mass = $13.5 g$

$$\text{Density} = \frac{13.5g}{5.0cm^3} = 2.7\ g/cm^3$$

2. Earth Science example: Weather is created by moving air masses of different densities

☆ possible essay

End of 2.1, Review problems: Sec 2.1
14-18, 20

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Results

	A	B	C	D	E	F	G	H	I	J
Mass (g)										
Volume mL										
Density g/mL →										

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$1.4937\,g + 1.2\,g =$

round

$1.6937\,g$

$1.7\,g$

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2.2. Scientific Notation

Main idea → Scientists often express #s in scientific notation and solve problems using dimensional analysis

I. Scientific Notation – used to express any number as a number between 1 and 10 multiplied by 10 raised to a power (ex: 1.4×10^{-3})

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a) $(2 \times 10^3) \times (3 \times 10^2)$

multiply
1) multiply the coefficients
$2 \times 3 = 6$
2) add exponents $10^3 + 10^2 = 10^5$
3) (6×10^5)

b) $(9 \times 10^8 \div)(3 \times 10^{-4})$

division
1) divide coefficients → $9/3 = 3$
2) $8 - (-4) = 12$ subtract exponents
3) (3×10^{12})

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II Dimensional Analysis – a systematic approach to problem solving that uses conversion factors to move, or convert from one unit to another

A. Conversion Factor: a ratio of equivalent values that have different units

1. Multiplying a quantity by a conversion factor changes the units of the quantity without changing its value

a. %s can also be used as conversion factors

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2. A conversion factor used in dimensional analysis must accomplish two things:

a) must cancel 1 unit

b) and introduce a unit

$\rightarrow \frac{1\,km}{1000\,m}$ and $\frac{1000\,m}{1\,km}$

example $48\,km \rightarrow m$

g/mL

$$48\,km \times \left(\frac{1000\,m}{1\,km}\right) = 48{,}000\,m$$

$m/s \rightarrow km/hr$

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1 Solve (2x 10^7) x (2x 10^ 3)

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2 Solve (8x10^9) / (2x10^2)

coefficient 8/2

exponents (division) = subtract 9-2

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3 Express number in scientific notation (3x10^-11) + (4x10^-11)

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4 Convert 60 s to Ms

$(60 \times 10^{-6}) \rightarrow 10^{6}$

$60\cancel{s} \times \frac{1\,Ms}{1000000\cancel{s}} = 0.00006\ Ms$

60×10^{-6}

$60\ \mu s \rightarrow Ms$

$60\cancel{\mu s} \times \frac{1s}{1000,000} \times \frac{1\ Ms}{\quad}$ Ms

.000001

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5 Convert 5200 mg to kg

$$5200\,\cancel{mg} \times \left(\frac{1\,g}{1000\,mg}\right) \times \frac{1\,kg}{1000\,g} = 0.0052$$

5.2×10^{-3}

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6 Convert 7.100 x 10^3 cm to km

7.9977 7.998 7.9999 → 8.000

$$7100\,\cancel{cm} \times \frac{1\,\cancel{m}}{100\,\cancel{cm}} \times \frac{1\,km}{1000\,m}$$

.071

7.1×10^{-2} km

7.100×10^{-2}

4.445×10^{-3}

$+\ 8.954\times10^{-6}$

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7 Convert 68 g to pg

$$68g \times \frac{1,000,000,000\ \mu g}{1g} =$$

10^{-12}

.00000

10^{12}

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2.3. Uncertainty in Data

I. Percent Error Equation =

$$\text{Error} \longrightarrow \frac{|AV-EV|}{AV} \times 100$$

A. EV = Experimental Value are values measured during an experiment

B. AV = accepted value = known value

C. Error = AV - EV

Oct 2-8:14 AM

II Significant Figures (Sig Figs)

A. Rules 1-5

1. non zeros are always significant
   ex: 72.3 = 3 sig figs
2. All final zeros to the right of the decimal are signifant 6.20 = 3 sig figs (sig)
3. Any zero between sig figs is significant
   ex: 60.5 = 3 sig figs
4. Placeholder zeros are not significant
   → to rewrite the number w/out placeholder zeros, put the number in scientific notation. 0.0253 → 2.53×10^{-2} = 3 sig figs
   ex: 4320 = 3 sig figs

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5. Counting numbers and defined constants have an infinite number of sig figs

ex: 6 molecules, 60s = 1m

1730. molecules

Oct 2-8:57 AM

III Rounding Numbers

A. Numbers need to be rounded according to significant figures

B. Rules 1-4 for rounding

1. If digit is to right of the last sig fig is less than 5, do not change (round)

   ex: 2.532 → 2.53

2. If digit to the right of last sig fig is greater than 5, round up last sig fig

   ex: 2.536 → 2.54

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3. If the digit to the right of the last sig fig are a 5 followed by a nonzero digit, round up the last sig fig

   ex: 2.5351 → 2.54

4. If the digits to the right of the last sig fig are a 5 followed by 0 or no others at all, look at the last sig. fig. If it is odd round up, even do not round up

odd ex:
2.5350 → 2.54

even ex:
2.5250 → 2.52

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C. Addition + Subtraction

1. When you add or subtract measurements, the answer must have the same # of digits to the right of the decimal as the original value having the fewests #s of digits to the right of the decimal

→ 28.0 cm
23.528 cm
25.68 cm

77.208 → 77.2 cm

Oct 4-8:16 AM

D. Multiplication + Division

1. When you multiply or divide, the answer must have the same # of sig figs as the measurement with the fewest sig figs

Section 2.3 → practice problems 40-41
HW → 45-51

Volume = l x w x h

volume = 28.3 cm x 22.2 cm x 3.65 cm
→ 2293.149 cm^3 → 3 sig figs → 2290 cm^3

Oct 4-8:42 AM

2.4 Representing Data

I. Graphing

A. Using a graph to help assess data can help reveal patterns in data

B. __Graph__ - a visual display of data

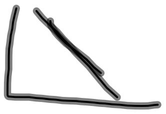
1. Circle (or Pie Graph/(Chart) Graph - useful for showing parts of a fixed whole
   a. quantities are generally expressed a %s
2. Bar Graph - used to show how a quantity varies across categories
   → a. dependent variable on y-axis, independent variable on x-axis

Oct 5-8:13 AM

3. Line graph - popular in chemistry, points on a line graph represent the intersection of data pts.
   a. depend. var. on y-axis + independ. var. on x-axis
   b. line of best fit - straight line that connects the most data points, or that has as many data points above the line as below

C. Slope of a Graph

1. Slope $= \frac{\Delta y}{\Delta x} =$ rise/run $\rightarrow \frac{y_2 - y_1}{x_2 - x_1}$



negative slope

positive slope

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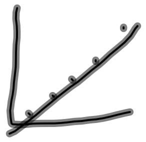
D. Interpreting Graphs - how does the depend. + indepen. variable compare



1. If points on a line graph are connected, data is said to be continuos
   a. interpolate - reading a value from the line of best fit between recorded data points
   b. extrapolate - estimating values beyond line of best fit (lbf) based on direction of lbf + data points

→ Chapter 2 Review Problems

#s 66-69, 76-79, 91-94, 97-98

Oct 9-8:47 AM